

ARGONNE NATIONAL LABORATORY-WEST (ANL-W)

Argonne National Laboratory-West (ANL-W) is located in Southeastern Idaho on the Idaho National Engineering and Environmental Laboratory site. ANL-W is part of Argonne National Laboratory (ANL) located near Chicago. The ANL-W site is about 35 miles west of Idaho Falls, Idaho. ANL is a non-profit research Laboratory operated by The University of Chicago for the United States Department of Energy. A broad range of national problems are solved through ANL research and development activities.

Research at ANL-W is focused on areas of national concern including those relating to energy, nuclear safety, spent nuclear fuel, nonproliferation, decommissioning and decontamination technologies, and similar work. Typically, basic research is conducted at the main Laboratory near Chicago, with large-scale testing and development at the Idaho site. Nuclear fuel development, post irradiation examinations, characterization, and development of dry storage for spent fuels and other materials are but some of the accomplishments at ANL-W.

709 NUCLEAR MATERIAL SAFEGUARDS AND NONPROLIFERATION

Comp. Sci. Argonne National Laboratory-West is involved in a number of nuclear material safeguards and nonproliferation activities. Included in these areas are projects involving advanced software development, e.g., expert systems, statistical signal processing, artificial intelligence applications, for safeguard data analysis and material characterization. The Laboratory operates the Safeguard Technology Evaluation Laboratory where evaluation of plutonium monitoring and surveillance systems are evaluated under static and transient conditions. Opportunities exists in the areas of software development, electronic system design and analysis and nondestructive assay and testing of packaged nuclear materials.

Elec. Engr.

Nucl. Engr.

Phy.

710 NONDESTRUCTIVE ASSAY AND NONDESTRUCTIVE EVALUATION

Comp. Sci. Characterization and examination of radioactive materials is a critical element in a number of priority DOE programs including spent fuel and waste disposition, national security, nuclear nonproliferation and nuclear facility operations. The ANL-West facility infrastructure is well-suited for supporting materials characterization through nondestructive assay and nondestructive evaluation techniques. The Hot Fuel Examination Facility (HFEF) hot cell and irradiated material handling capabilities are ideal for performing radiological characterization of highly radioactive materials. In addition, HFEF offers a 14 MeV neutron generator and a 250 kW TRIGA reactor that provide neutron radiography and neutron activation analysis of both hot and cold materials. Other capabilities include gamma-ray spectroscopy, coincidence neutron assay, gamma-ray imaging, and system modeling and computation. This suite of tools is used for both routine safeguards measurements and the development of new assay methods.

Elec. Engr.

Math.

Nucl. Engr.

Phy.

711 ELECTROMETALLURGICAL SPENT FUEL TREATMENT

Chem. Part of DOE's spent nuclear fuel inventory consists of fuel elements containing elemental sodium, which was used to provide a thermal bond between the fuel matrix and cladding.

Chem. Engr. The sodium metal within the fuel is highly reactive and consequently, fuel treatment is required before disposal in a permanent repository. Argonne National Laboratory has successfully demonstrated a nonaqueous electrometallurgical treatment of sodium-bonded fuel that includes: 1) electrorefining to separate uranium from fission products, plutonium and matrix materials; 2) a ceramic waste process to encase the plutonium and fission products into a durable waste form and 3) a metal waste process that consolidates activated fuel element hardware. With the technology demonstration complete, Argonne is now translating the new technology into a large-scale treatment process for DOE sodium-bonded fuels.

Math.

Mat. Sci. Mech. Engr. Nucl. Engr. Phy.

712 ANALYTICAL CHEMISTRY FOR NUCLEAR WASTE MANAGEMENT

Chem. An integral component of the Electrometallurgical Spent Fuel Treatment program at ANL-West is a state-of-the-art Analytical Chemistry Laboratory complex that accommodates analysis of spent fuel isotopic inventories, characterization of hazardous and highly radioactive waste, and evaluation of waste forms. The Analytical Laboratory capabilities include mass spectrometry, inductively coupled plasma-atomic emission spectrometry, atomic absorption spectrometry, chromatography and a variety of radiation detection capabilities. Hot cell and glove box capabilities make it possible for ANL-West researchers to apply these techniques in the study of radioactive and hazardous materials.

Envr. Sci.

Math. Mat. Sci.

713 ADVANCED NUCLEAR FUELS AND MATERIALS

Chem. Argonne's long history of fuel development and testing continues with research projects exploring thorium-based fuels, fuels for accelerator driven systems, ultra-long lived fuels and proliferation-resistant fuels. In addition, Argonne is a lead laboratory for the development of Generation IV reactor designs and will be charting the course for next generation fuel design, fabrication and testing. ANL-West is uniquely qualified to design, test and evaluate nuclear fuels. The Fuel Manufacturing Facility provides on-site fuel fabrication capabilities and the Transient Reactor Test (TREAT) facility is designed to provide safety-related testing of nuclear fuels. TREAT is an air-cooled reactor that provides short, very intense bursts of nuclear energy and can simulate accident conditions up to and including melting or vaporization of test specimens. The ANL-West nuclear fuel development loop is closed with a comprehensive irradiated material examination capability at the Electron Microscopy Laboratory. Scanning and transmission electronic microscopes are used for imaging and identifying irradiation-induced effects and to provide a better understanding of how irradiation affects mechanical properties in a variety of materials.

Chem. Engr.

Comp. Sci.

Mat. Sci.

Nucl. Engr.

714 WASTE MANAGEMENT AND ENVIRONMENTAL TECHNOLOGY

Chem. Environmental and waste management issues are among the most pressing for the U. S.
Chem. Department of Energy. The successful remediation of environmental contamination from
Engr. the defense nuclear legacy and the proper treatment of radioactive and hazardous wastes
from ongoing operations comprise a multi-billion dollar per year set of activities in the
U.S. Continued development and deployment of nuclear energy technologies capable of
Comp. meeting world energy demands with no carbon emissions will depend on the success of
Sci. these projects and on the development of waste management strategies for future nuclear
energy systems. ANL-West is tackling difficult problems related to the characterization,
Envr. treatment and disposal of mixed and transuranic waste. Specific projects include
Engr. developing mixed waste treatment methods for high-activity remote-handled spent
HEPA filters, studying supercritical fluid extraction techniques for the removal of
Envr. organics from radioactive waste, applying polymer gels and ion exchange media to
Sci. liquids treatment, and developing alternatives to incineration for certain waste types. In
addition, we are studying radiolytic, chemical and microbial gas production in materials
Indust. ranging from raw wastes and treatment products to special nuclear materials. Argonne's
Engr. rich history of fast reactor development has led us into current projects in metallic
sodium stabilization, spent fuel storage and collaborative work on the decommissioning
Nucl. of the BN-350 breeder reactor in Kazhakstan. Finally, we are readying our facilities to
Engr. support critical DOE research initiatives related to vadose zone contaminant study and
the demonstration of alternatives to incineration.

715 ENGINEERING SUPPORT GROUPS

Chem. The support functions at ANL-West include many site-wide services to the major facilities.

Civil

Engr.

- a. Engineering provides engineering design and project management support for new buildings, building additions and modifications to the physical plant facilities. The functional specialties include project management, mechanical, electrical, civil, architectural and structural engineering.

*Comp.
Sci.*

Elec.

Engr.

- b. The Environment, Safety and Waste Management (ESM) Department is responsible for the environment, safety and health, and waste management for the ANL-W Site. The mission is to ensure the implementation of all Laws (Federal and State), Regulations, DOE Orders and good practices required to ensure the quality of the environment, safety and health of the employees and general public.

*Indus.
Safety*

Mat.

Sci.

- c. The Operations Support Group is responsible for providing maintenance engineering, environmental engineering and safety analysis for the day to day activities of the operating facilities. Typical activities include providing technical direction for waste stream analysis, packaging, storage, treatment, and disposal; providing safety analysis for proposed modifications to operating facilities; and providing electrical engineering, instrumentation and controls engineering, and mechanical engineering support to the maintenance crafts and facility managers.

Mech.

Engr.

*Radio-
Chem.*

The safety responsibilities include radiation protection, fire protection, industrial hygiene, and industrial safety. Environment and waste management includes the control of hazardous radioactive and radioactive mixed waste; control of emissions; and ESM manages the DOE Environmental Restoration and Waste Management. (ER/WE)_ Five Year Plan which designates funding and established the context within which environmental cleanup, waste operations and research and development activities at DOE sites are performed.